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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/065,711	11/12/2002	Ching-Yu Chang	JCLA9374	4262
23900	7590	01/08/2004	EXAMINER	
J C PATENTS, INC. 4 VENTURE, SUITE 250 IRVINE, CA 92618			BARRECA, NICOLE M	
			ART UNIT	PAPER NUMBER
			1756	

DATE MAILED: 01/08/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/065,711

Applicant(s)

CHANG, CHING-YU

Examiner

Nicole M. Barreca

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-18 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 12 November 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). ____
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____ 6) ☐ Other: ____

DETAILED ACTION

1. Claims 1-18 are pending in this application.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1, 3, 4, 10, 12-14 are rejected under 35 U.S.C. 102(b) as being anticipated by Adair (US 5959325).
4. Adair discloses a patterning process. A first resist layer 360 is deposited, exposed and develop to form a regular grating pattern having lines in the direction of the x-axis or y-axis. A second layer of resist 380 is then deposited, exposed and developed to form a second pattern of lines orthogonal to the first direction. The second pattern is in a non-grating "dog-bone" shape (i.e. varying length). See example 3 in col.11-12.
5. Claims 1-3, 5, 7-12, 14-16 are rejected under 35 U.S.C. 102(e) as being anticipated by Hwang (US 6664028).

6. Hwang discloses a patterning method. A first negative photoresist layer 120 is formed on insulation layer 110, exposed and developed. A KrF (248 nm) excimer laser is used to form parallel strips spaced from each other with a pitch/size. A post exposure bake (hardening) is performed, prior to the development. A second positive photoresist layer 130 is formed, exposed using a KrF excimer laser and developed. The parallel strips formed in the second photoresist layer are perpendicular to the strips formed in the first photoresist layer. Square opening 140 are formed from the overlapping of these parallel strips. The width of each of each opening is about 0.1 microns (about $\frac{1}{2}$ of the wavelength of light) (col.2, 1-40). Please note that half of the wavelength of the exposure light is 0.124 microns, which is 0.10 microns or 0.12 microns, depending on the number of significant digits used, thereby meeting the limitations of claim 9.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Adair or Hwang as applied to claim 1 above, and further in view of Furukawa (US 6303272).

9. The teachings of Adair and Hwang have been discussed previously. The references individually teach a patterning method for forming orthogonal patterns using two photoresist layers with separate exposure and development steps. The references

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do not disclose exposing the photoresists to off-axis illumination. Furukawa also teaches a patterning method for forming orthogonal patterns using two photoresist layers, exposed and developed in two separate steps. Such orthogonal features may also be exposed using conventional off-axis illumination in order to further enhance the resulting image (col.5, 25-37). It would have been obvious to one of ordinary skill in the art to expose the photoresist layers to off-axis illumination in the methods of Adair or Hwang because Furukawa teaches that these orthogonal features may be further enhanced by exposing the two photoresists layers to conventional image enhancement processes, such as an off-axis illumination.

10. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hwang as applied to claim 16 above, and further in view of Ng (US 5876903).

11. The teachings of Hwang have been discussed above. While Hwang discloses hardening the first photoresist pattern (using a post-exposure bake), the reference does not disclose hardening the photoresist by implanting Ar or N₂ ions with a dosage of about 1×10^{14} to about $3 \times 10^{15}/\text{cm}^2$ at an energy of about 2 to about 50 KeV. Ng teaches a method for hardening a photoresist layer, which allows the photoresist pattern to withstand subsequent exposure to etchants and other chemicals. A typical ion implantation would comprise implanting Ar ions at $1 \times 10^{15}/\text{cm}^2$ at an energy of about 40 KeV (col.4, 35-46). It would have been obvious to one of ordinary skill in the art to harden the first photoresist pattern by implanting Ar or N₂ ions with a dosage of about 1×10^{14} to about $3 \times 10^{15}/\text{cm}^2$ and an energy of about 2 to about 50 KeV in the method of

Hwang because Ng teaches that hardening a photoresist by ion implantation, such as by implanting Ar ions at $1 \times 10^{15}/\text{cm}^2$ at an energy of about 40 KeV, will allow the photoresist pattern to withstand subsequent exposure to etchants and other chemicals.

12. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hwang as applied to claim 16 above, and further in view of Furihata (US 5618892).

13. The teachings of Hwang have been discussed above. While Hwang discloses hardening the first photoresist pattern using a post-exposure bake, the reference is silent on the baking conditions and does not disclose baking at a temperature from about 100-150 °C at about 30-180 seconds. Furihata teaches that a typical post-exposure bake of a negative photoresist exposed at 248 nm is at a temperature of about 80-130 °C for about 1-5 minutes (col.6, 33-41). It would have been obvious to one of ordinary skill in the art to perform the post-exposure bake of the first photoresist pattern at a temperature of about 100-150 °C for about 30-180 seconds in the method of Hwang because Furihata teaches that a typical PEB process for a negative photoresist is at a temperature of about 80-130 °C for about 1-5 minutes.

Conclusion

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nicole M. Barreca whose telephone number is 571-272-1378. The examiner can normally be reached on Monday-Thursday (8:00 am-6:30 pm).

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on 571-272-1385. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

12/18/03

A handwritten signature in cursive script, appearing to read "Nicole Barreca".

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**NICOLE BARRECA
PATENT EXAMINER**